DOCUMENT RESUME

ED 046 667 RE 003 287

AUTHOR Follman, John; And Others
TITLE Canonical and Partial Correlation of Critical Reading/Critical Thinking Test Scores--Twelfth Grade.
PUB DATE Dec 70
NOTE 6p.; Paper presented at the National Reading Conference, St. Petersburg, Fla., Dec. 2-5, 1970
AVAILABLE FROM Twentieth Yearbook of the National Reading Conference, Inc., Marquette University, 1217 W. Wisconsin Ave., Milwaukee, Wis. 53233

EDRS PRICE EDRS Price MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS Achievement Tests, Aptitude Tests, *Correlation, *Critical Reading, *Critical Thinking, Factor Analysis, *Grade 12, Intelligence Tests, Reading Research, *Reading Tests, Thought Processes, Verbal Ability

ABSTRACT

The definition of critical reading and also the relationship between critical reading and critical thinking, reading, and scholastic aptitude and achievement tests were investigated. The Reading Comprehension Test; Test of Critical Thinking, Form G; Nelson-Denny Reading Test, Form A; Lorge-Thorndike Intelligence Tests, Form A; and Florida Statewide Twelfth Grade Tests were administered to twelfth-grade students in Robinson High School, Hillsborough County, Florida. Critical reading and critical thinking correlated low when verbal intelligence was partialled out, and moderately when IQ total, reading vocabulary, reading total, reading index, respectively were partialled out. When both intelligence and reading were removed in second-order partials, the correlations between critical reading and critical thinking were low. The canonical correlations were all in excess of .67 between four sets of subtests: critical reading, critical thinking, reading, and reading and verbal and achievement. It was concluded that critical reading/critical thinking may exist as a thinking activity, but that critical reading/critical thinking overlaps strongly with verbal ability to such an extent that verbal ability may account for critical reading/critical thinking. References are given. (Author/DE)

ED 046667

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY

National Reading Conference

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE U.S. OFFICE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Canonical and Partial Correlation of Critical Reading Critical Thinking Test Scores--Twelfth Grade

John Follman Roger Johnson Russell Wiley A. J. Lowe William Miller

University of South Florida

RE 003 287

Introduction

This study is the third and last of three statistical analyses of critical reading test scores of twelfth grade students. The twelfth grade data represents half of an overall empirical examination of the definition of critical reading and its relation with critical thinking, intelligence, achievement, and reading. The other half of the overall empirical examination of the definition of critical reading is a parallel series of three analyses of critical reading test scores of fifth grade pupils.

In the first analysis of the twelfth grade data, Follman, Lowe and Wiley (3) conducted correlational and factor analysis of total test scores, and subtest scores

independently of:

Reading Comprehension Test (CR) (Martin, 5) total
- Main Points (MAIN PTS) subtest
- Specific Facts (SPEC FACTS) subtest
- Cause and Effect Relationships (CAUSE EFFECT) subtest
- Inference (INFERENCE) subtest
- Vocabulary (VOCAB) subtest

Test of Critical Thinking Form G (CT) (ACE, 1) total
- Pertinent Information (PERT INFO) subtest
- Valid Inferences 1 (VAL INF 1) subtest
- Valid Inferences 2 (VAL INF 2) subtest
- Relevant Generalizations (REL GENS) subtest
- Recognition of Assumptions (RECOG ASSUMP) subtest
- Valid Inferences 3 (VAL INF 3) subtest
- Valid Inferences 4 (VAL INF 4) subtest
- Hypothesis Verification 1 (HYP VER 1) subtest
- Hypothesis Verification 2 (HYP VER 2) subtest

Nelson-Denny Reading Test Form A (READ) (Brown, 2) total
- Vocabulary (VOCAB) subtest
- Comprehension (COMP) subtest

Lorge-Thorndike Intelligence Tests Form A (IQ) (Lorge and Thorndike, (4) total
- Vocabulary (VOCAB) subtest
- Sentence Completion (SENT COMP) subtest
- Arithmetical Reasoning (ARITH REAS) subtest
- Verbal Classification (VERB CLASS) subtest
- Verbal Analogies (VERB ANAL) subtest
- Figure Classification (FIG CLASS) subtest
- Number Series (NO SERIES) subtest
- Figure Analogies (FIG ANAL) subtest

Florida Statewide Twelfth Grade Tests (FLA) (Swineford, 7) total
- Verbal (VERB) subtest
- Quantitative (QUAN) subtest
- English (ENGLISH) subtest
- Social Science (SOC SCI) subtest
- Natural Science (NAT SCI) subtest
- Mathematics (MATH) subtest
- Reading Index (READ INDEX) subtest

It was concluded therein that critical reading overlaps substantially with reading, thinking, and language activities particularly vocabulary and that there is considerable overlap between critical reading and critical thinking.

The purpose of the present study is to examine through partial correlation and canonical correlation the definition of critical reading and also the relationship between critical reading and critical thinking found in the factor analyses.

Partial correlation was used to hold constant respectively, intelligence, reading, and intelligence and reading together. It was anticipated that low to

moderate significant correlations would obtain between critical reading and critical thinking with intelligence and/or reading partialled out. Such correlation(s) would be prima facie evidence of overlap variance between critical reading and critical thinking with intelligence and/or reading ability removed.

Canonical correlation was used to determine the maximum relationships among five sets of subtests: critical reading; critical thinking; reading; and two sets of reading, language and achievement subtests. It was anticipated that high significant canonical correlations would obtain in all comparisons. Such correlations would be prima facie evidence of large overlap presumably language ability.

Procedure

The subjects (Ss), typical twelfth grade pupils from Robinson High School, Hillsborough County, Florida, were tested in the fall of 1969. The Ss were predominately white, upper lower and lower middle class.

Partial correlations, second order partial correlations, and canonical correlations were computed to determine the relationships between various combinations of subtests.

Ns were 52 and 50 in all analyses.

Results

Table 1 indicates the first and second order partial correlations (and zero order correlations) with respectively IQ VERB, IQ total, READ VOCAB, READ total, READ INDEX, IQ VERB and READ VOCAB together, IQ VERB and READ total together, IQ total and READ VOCAB together, and IQ total and READ total together, held constant.

The first order partial correlations with IQ VERB partialled out were all low and non-significant except one which while significant was low, .23. This is interpreted to mean that little common variance remains with critical reading and reading vocabulary, with critical thinking and reading vocabulary, with critical reading and reading, with critical thinking and reading, and crucially with critical reading and critical thinking, respectively, after verbal intelligence has been removed.

The first order partials with IQ total, and READ VOCAB, READ total, and READ INDEX respectively removed though significant were relatively weak. This may

be interpreted to mean that some common variance may remain with critical reading and critical thinking, after intelligence total, and reading was removed, more variance than remained when verbal intelligence was removed.

The first order partial correlations with IQ VERB or READ INDEX partialled out were all substantially lower than the first order partials with IQ total including IQ non-verbal variance partialled out. The difference in strength is so great that the inference is inescapable that verbal ability is heavily involved, nearly isomorphically with reading, critical thinking, and critical reading. Apparently READ VOCAB and READ total include some variance different from IQ VERB and also from CR and CT which may account for the higher correlations when they are partialled out.

In order that more precise inferences about the influence of verbal intelligence on critical reading and critical thinking could be made, three multiple regression equations, and part correlations (Pugh, 6) were calculated. Of the 53% of the total variance that can be explained from the multiple regression coefficient of .73 for CR considering the influences of CT and IQ VERB, 4% was unique to CT, 11% was unique to IQ VERB, and 38% was joint variance of CT and IQ VERB. Of the 59% of the total variance that can be explained from the multiple regression coefficient of .77 for CT considering the influence of CR and IQ VERB, 3% was unique to CR, 17% was unique to IQ VERB, and 39% was joint variance of CR and IQ VERB. Of the 66% of the total variance that can be explained from the multiple regression coefficient of .81 for IQ VERB considering the influence of CR and CT, 8% was unique to CR, 15% was unique to CT, and 43% was joint variance of CR and CT. It is apparent from these part correlations that verbal intelligence has a unique contribution to critical reading, and critical thinking respectively, larger than the unique contributions of critical thinking to critical reading or critical reading to critical thinking. It is also apparent that there is considerable common variance between verbal intelligence, critical reading, and critical thinking. Verbal ability is therefore a necessary and perhaps sufficient condition for critical reading - critical thinking.

The four second order partial correlations were all low and three were signifi-

cant. These correlations are additional evidence of the influence of verbal ability, particularly vocabulary which when partialled out, without the non-verbal aspects of IQ total, produces a lower correlation indicating that critical reading - critical thinking relates strongly to verbal, vocabulary ability. Whether IQ total, READ VOCAB, or READ total was partialled out seems to make little difference. The correlations may also be seen as some evidence for the existence of some common critical reading - critical thinking variance.

Thus the second order partial correlations provide evidence of a profound relationship between verbal ability and critical reading - critical thinking, and also some possible evidence for the existence of critical reading - critical thinking. This evidence reinforces similar interpretations of the first order partials. However, while there is substantial common variance between verbal intelligence particularly vocabulary, critical reading, and critical thinking and this overlap may possibly be interpreted as evidence for the existence of the construct of critical reading - critical thinking, a more parsimonious interpretation is that verbal intelligence per se is a necessary and very possibly sufficient condition for the explanation of the construct of critical reading - critical thinking.

Table 2 indicates the canonical correlations between the following sets of subtests: critical reading vs. critical thinking subtests (1 vs. 2); critical reading subtests vs. reading subtests (1 vs. 3); critical reading subtests vs. reading, verbal and achievement subtests (1 vs. 4); critical thinking subtests vs. reading subtests (2 vs. 3); critical thinking subtests vs. reading, verbal, and achievement subtests (2 vs. 5); and critical reading and critical thinking subtests together vs. reading, verbal, and achievement subtests (1,2 vs. 5).

The canonical correlations were all high, in excess of .67, indicating strong overlap between the different sets of subtests. The critical reading subtests correlated .84 with the critical thinking subtests, prima facie evidence of strong overlap between critical reading and critical thinking. The critical reading subtests correlated .83 with the reading and achievement subtests, the critical thinking sub-

tests correlated .89 with a similar set of reading and achievement subtests, and the critical reading and critical thinking subtests correlated .93 with them. These four correlations indicate substantial overlap between critical reading and reading and language achievement, between critical thinking and reading and language achievement, and between critical reading and critical thinking.

In summary, the canonical correlations provide evidence that critical reading and critical thinking share common variance and crucially that critical reading - critical thinking represents very considerable language ability.

Conclusions

1. Critical reading - critical thinking may exist as a thinking activity although verbal intelligence is probably an adequate explanation of the construct of critical reading - critical thinking.

2. Critical reading - critical thinking has a profound relationship with verbal ability particularly vocabulary.

3. A final caveat, the validity of any correlational study depends upon the validity and reliability of the tests and subtests used.

References

1. ACE, American Council on Education, Test of Critical Thinking Form G, 1951.

2. Brown, J. I. The Nelson-Denny Reading Test. (Revised) Houghton Mifflin Company, Boston, 1960.

3. Follman, J., Lowe, A. J., and Wiley, R. Correlational and factor analysis of critical reading and critical thinking - twelfth grade. Unpublished study, University of South Florida, 1969.

4. Lorge, I., and Thorndike, R. The Lorge-Thorndike Intelligence Tests. Houghton Mifflin Company, Boston, 1954.

5. Martin, M. E. The Construction of a Diagnostic Reading Test for Senior High School Students and College Freshmen. Bureau of Publications, Teachers College, Columbia University, 1939.

6. Pugh, R. C. The Partitioning of Criterion Score Variance Accounted for in Multiple Correlation. American Educational Research Journal, 1968, 5, 639-646.

7. Swineford, F. Florida Statewide Twelfth Grade Testing Program PRT. Educational Testing Service, Princeton, New Jersey, 1968.